

I Claim:

1. A high capacity microarrayer for spotting solution onto slides, comprising:
 - A) a solution removal area,
 - B) a microplate indexing device for sequentially indexing solution filled microplates to said solution removal area,
 - C) a slide positioning station for positioning slides,
 - D) a dispense head for accessing said solution removal area and for removing solution from a solution filled microplate at said solution removal area to spot a slide at said slide positioning station.
2. The high capacity microarrayer as in Claim 1, wherein said microplate indexing device comprises:
 - A) a platform for positioning a plurality of microplates, and
 - B) a linear actuator, wherein said platform is mounted to said linear actuator.
3. The high capacity microarrayer as in Claim 1, wherein said microplate indexing device comprises:
 - A. at least one input stacking chamber for stacking microplates,
 - B. at least one output stacking chamber for stacking microplates, and
 - C. a walking beam indexer disposed between said at least one input stacking chamber and said at least one output stacking chamber wherein said walking beam indexer is for moving microplates from said at least one input stacking chamber to said at least one output stacking chamber, and
 - D. a lid lifter for lifting the lid off each microplate to permit the microplate to be accessed by said dispense head for solution removal, and after solution is removed to replace the lid.
4. The high capacity microarrayer as in Claim 3, further comprising:
 - A) an input chamber lifting mechanism for periodically lifting all microplates in said at least one stacking chamber except a bottom microplate, and

B) an output chamber lifting mechanism for lifting all filled microplates in said at least one output stacking chamber to provide a space for recently depleted microplates to be moved to a bottom position in said at least one stacking chamber.

5. The high capacity microarrayer as in Claim 4, further comprising a linear actuator, wherein said walking beam indexer is attached to said linear actuator.

6. The high capacity microarrayer as in Claim 1, further comprising:

- A. at least one light source capable of illuminating the slides,
- B. at least one camera operating in conjunction with said at least one light source, said at least one camera capable of acquiring and transmitting slide image data,
- C. a computer programmed to:
 - 1) receive said slide image data from said at least one camera,
 - 2) analyze said slide image data, and
 - 3) generate post analysis data based on said analysis of said slide image data, wherein said post analysis data is available for improving the spotting of the solution.

7. The microarrayer as in Claim 6, wherein an operator has the option of making adjustments to the spotting process based on the analysis of said slide image data.

8. The microarrayer as in Claim 6, wherein adjustments to the spotting process are automatically made via said computer based on said post analysis data.

9. The microarrayer as in Claim 6, wherein said slide image data comprises information relating to slide alignment.

10. The microarrayer as in Claim 9, wherein said computer makes automatic adjustments to the microarrayer based on said post analysis data.

11. The microarrayer as in Claim 6, wherein said slide image data comprises information relating to spot quality.

12. The microarrayer as in Claim 11, wherein the post analysis data reports the spot quality as pass or fail.

13. The microarrayer as in Claim 12, wherein the microarrayer operator can rework a failed spot via the microarrayer based on said report of said post analysis data.

14. The microarrayer as in Claim 12, wherein said computer automatically reworks a failed spot via the microarrayer based on said report of said post analysis data.

15. The microarrayer as in Claim 6, wherein said slide image data comprises slide identification information.

16. The microarrayer as in Claim 15, wherein said slide identification information is contained in the slide's 2D bar code.

17. The microarrayer as in Claim 6, wherein said slide image data comprises:

- A) information relating to slide alignment,
- B) information relating to spot quality, and
- C) slide identification information.

18. The microarrayer as in Claim 6, further comprising a three axis robotic positioning stage for presentation of the slides and said at least one dispense head.

19. The microarrayer as in Claim 18, wherein said three axis robotic positioning stage comprises three linear actuators.

20. The microarrayer as in Claim 6, further comprising at least one cleaning station, comprising:

A) a sonic cleaner,
B) a rinsing fountain, and
C) a vacuum manifold.

21. The microarrayer as in Claim 6, wherein said at least one dispense head is two dispense heads, wherein the first of said two dispense heads is a main dispense head, wherein the second of said two dispense heads is a rework dispense head.

22. The microarrayer as in Claim 21, further comprising a dispense head assembly, comprising:
A) a mounting plate attached to the microarrayer via a linear actuator,
B) a pneumatic slide mounted to said mounting plate,
wherein said main dispense head is mounted to said mounting plate and wherein said rework dispense head is mounted to said pneumatic slide enabling said rework dispense head to move above or below said main dispense head.

23. The microarrayer as in Claim 6, wherein said camera is a CCD camera comprising a C-mount lens capable of providing the proper field of view and magnification for reading of the slides' 2D bar code and for acquiring said slide image data.

24. The microarrayer as in Claim 6, further comprising a vibration isolated base pneumatically isolated from the microarrayer, wherein said vibration isolated base assists in absorbing the shock of external vibrations.

25. The microarrayer as in Claim 6, wherein said computer comprises:
A) a PC based controller comprising VISUAL BASIC programming, and
B) a touch screen monitor for user interface.

26. The microarrayer as in Claim 6, wherein said computer is capable of being connected to a computer network for remote monitoring and control.

27. The microarrayer as in Claim 6, wherein further comprising at least one dispense tip attached to said at least one dispense head.

28. The microarrayer as in Claim 6, wherein said at least one dispense tip is a quill type dispense tip.

29. The microarrayer as in Claim 6, wherein said at least one dispense tip is a piezo type dispense tip.

30. The microarrayer as in Claim 6, wherein said at least one light source is a strobe light.

31. The microarrayer as in Claim 6, wherein said at least one light source is a fluorescence device.

32. A high capacity microarrayer for spotting solution onto slides, comprising:

- A) a solution removal area,
- B) a microplate indexing means for sequentially indexing solution filled microplates to said solution removal area,
- C) a slide positioning means for positioning slides,
- D) a dispense head means for accessing said solution removal area and for removing solution from a solution filled microplate at said solution removal area to spot a slide at said slide positioning station.

33. The high capacity microarrayer as in Claim 32, wherein said microplate indexing means comprises:

- A) a platform means for positioning a plurality of microplates, and
- B) a linear actuator means, wherein said platform means is mounted to said linear actuator means.

34. The high capacity microarrayer as in Claim 32, wherein said microplate indexing device comprises:

- A. at least one input stacking chamber means for stacking microplates,
- B. at least one output stacking chamber means for stacking microplates, and
- C. a walking beam indexer means disposed between said at least one input stacking chamber means and said at least one output stacking chamber means wherein said walking beam indexer means is for moving microplates from said at least one input stacking chamber means to said at least one output stacking chamber means, and
- D. a lid lifter means for lifting the lid off each microplate to permit the microplate to be accessed by said dispense head means for solution removal, and after solution is removed to replace the lid.

35. The high capacity microarrayer as in Claim 34, further comprising:

- A) an input chamber lifting means for periodically lifting all microplates in said at least one stacking chamber means except a bottom microplate, and
- B) an output chamber lifting means for lifting all filled microplates in said at least one output stacking chamber means to provide a space for recently depleted microplates to be moved to a bottom position in said at least one stacking chamber means.

36. The high capacity microarrayer as in Claim 35, further comprising a linear actuator means, wherein said walking beam indexer is attached to said linear actuator means.

37. The high capacity microarrayer as in Claim 32, further comprising:

- A. at least one light source means capable of illuminating the slides,
- B. at least one camera means operating in conjunction with said at least one light source means, said at least one camera means capable of acquiring and transmitting slide image data,
- C. a computer means programmed to:
 - 1) receive said slide image data from said at least one camera means,

- 2) analyze said slide image data, and
- 3) generate post analysis data based on said analysis of said slide image data, wherein said post analysis data is available for improving the spotting of the solution.